

**UTILITY  
PATENT APPLICATION  
TRANSMITTAL**

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.

9655-0001-2

First Named Inventor or Application Identifier

Arie M. WIJNEN, et al.

Title

ANTI-COPYING SYSTEM FOR AUDIO SIGNALS

**APPLICATION ELEMENTS**

See MPEP chapter 600 concerning utility application contents

ADDRESS TO:

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1. ☒ Fee Transmittal Form  
(Submit an original, and a duplicate for fee processing)
2. ☒ Specification [Total Pages 12]
3. ☒ Drawing(s) [Total Sheets 5]
4. Oath or Declaration [Total Pages 4]
  - a. ☒ Newly executed (original )
  - b. ☐ Copy from a prior application (37 CFR 1.63(d))  
(for continuation/divisional with Box 17 completed)  
[Note Box 5 below]
  - i. ☐ DELETION OF INVENTOR(S)  
Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
5. ☐ Incorporation By Reference (useable if Box 4b is checked)  
The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

**ACCOMPANYING APPLICATION PARTS**

6. ☒ Assignment Papers (cover sheet & document(s))
7. ☐ 37 CFR 3.73(b) Statement ☐ Power of Attorney  
(when there is an assignee)
8. ☐ English Translation Document (if applicable)
9. ☐ Information Disclosure ☐ Copies of IDS Citations  
Statement (IDS)/PTO-1449
10. ☐ Preliminary Amendment
11. ☒ White Advance Serial No. Postcard
12. ☒ Small Entity ☐ Statement filed in prior app,  
Statement(s) Status still proper and desired
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14. ☒ Other: NOTICE OF PRIORITY

15. If a CONTINUING APPLICATION, check appropriate box and supply the requisite information:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No:

16. Amend the specification by inserting before the first line the sentence:

This application is a ☐ Continuation ☐ Division ☐ Continuation-in-part (CIP)  
of application Serial No. , filed on .

**17. CORRESPONDENCE ADDRESS**

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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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Serial No: New Application

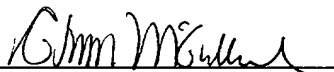
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CLAIMS	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS	
	TOTAL CLAIMS	17-20=	0	X \$22=	\$0.00	
	INDEPENDENT	3-3=	0	X \$82=	\$0.00	
	MULTIPLE DEPENDENT CLAIMS (if applicable)			+ \$270=	\$	
	LATE FILING OF DECLARATION			+ \$130=	\$	
				BASIC FEE		\$790.00
				TOTAL OF ABOVE CALCULATIONS =		\$790.00
	Reduction by 50% for filing by small entity				\$395.00	
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TOTAL				\$435.00		

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Respectfully submitted,

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Anti-copying system for audio signals.

#### BACKGROUND OF THE INVENTION

The present invention relates to an anti-copying system for audio signals, in particular digital audio signals.

Present day digital techniques allow perfect copies of audio signals to be made. For example, the digital audio information of a compact disc (CD) can be digitally registered on tape or can even be used to physically reproduce the CD by means of a so-called CD burner (recorder for compact discs). The possibility of digital copying, producing perfect copies of the original, has resulted in many illegal copies of CDs or other information carriers being made. This in turn leads to a substantial loss in copyright royalties. For this reason, there is a need for protection against copying of audio signals.

#### SUMMARY OF THE INVENTION

It is an object of the present invention to provide a method for protecting audio signals against unauthorized copying.

Accordingly, the present invention provides a method of protecting an audio signal against copying, the method comprising the step of mixing the audio signal with at least one non-audible disturbance signal.

By mixing the audio signal with a non-audible disturbance signal, that is an additional signal having a frequency lying outside the normal audible range, it is possible to obtain a combined audio signal which is, when replayed as it is, effectively undisturbed but which shows audible disturbances when copied.

Advantageously, a first disturbance signal is a low-frequency signal which is added to the audio signal. When the original audio signal and the low-frequency first disturbance signal have comparable amplitudes, the resulting mixed output signal will be highly resistant against copying to an analogue tape recorder. This aspect of the present invention

is based on the insight that slowly varying signals cause the magnetic heads of a tape recorder to effectively erase the recorded signal, or at least to suppress the recording of the signal.

5        Preferably, the low-frequency disturbance signal has a frequency of approximately 2 Hz, advantageously between 0.5 and 3 Hz, and has a substantially sinusoidal shape. These low frequencies are not audible, nor can they be reproduced by regular audio sets, yet they have the above-mentioned erasing  
10        effect.

Advantageously, a second disturbance signal is a high-frequency signal which is multiplied with the audio signal. This may effectively result in the original audio signal being substantially interrupted ("chopped") at a high  
15        interruption frequency. Although this regular interruption is normally not audible due to the high (non-audible) frequency involved, copying of the signal will result in an incomplete demodulation of the combined signal due to the characteristics of the copying devices.

20        Preferably, the high-frequency disturbance signal has a frequency of approximately 20 kHz, and has a substantially sinusoidal shape, although other shapes such as block pulses are also possible.

Preferably, both the first, low-frequency disturbance  
25        signal and the second, high-frequency disturbance signal are mixed with the original audio signal to produce a combined, copy-protected audio signal.

Advantageously, the audio signal is a digital signal representation involving a sampling frequency, and the second  
30        disturbance signal has a frequency which varies in time, preferably from approximately half to approximately three quarters of the sampling frequency. This results in a second disturbance signal having both a varying (preferably increasing) frequency and, due to the aliasing effects  
35        involved, a varying (preferably decreasing) amplitude. This results in a clearly audible amplitude modulation in the copied signal.

The second disturbance signal may also be frequency and/or amplitude modulated by auxiliary modulating signals, e.g. derived from the original audio signal.

5 The invention further provides a device for protecting audio signals against copying, comprising signal generation means for generating at least one non-audible disturbance signal, mixing means for mixing at least one disturbance signal with the audio signal, and output means for outputting the resulting mixed audio signal.

10

#### BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be further explained with reference to the accompanying drawings, in which:

15 Fig. 1 schematically shows possible applications of the method of the present invention.

Fig. 2 schematically shows a first disturbance signal as used in the method of the present invention.

Fig. 3 schematically shows a combination of the first disturbance signal of Fig. 2 and an audio signal.

20 Fig. 4 schematically shows the signal of Fig. 3 as recorded on a tape recorder.

Fig. 5 schematically shows the low-frequency disturbance signal as in Fig. 2.

25 Fig. 6 schematically shows the low-frequency disturbance signal of Fig. 5, multiplied with a continuous high-frequency disturbance signal.

Fig. 7 schematically shows the low-frequency signal of Figs. 5, to which a continuous high-frequency signal is added.

30 Fig. 8 schematically shows a low-frequency disturbance signal combined with high-frequency bursts.

Fig. 9 schematically shows an alternative embodiment of the signal of Fig. 8.

35 Fig. 10 schematically shows a disturbance signal which is frequency and/or amplitude modulated.

Fig. 11 schematically shows the effect of applying the disturbance signal of Fig. 10 to an audio signal.

Fig. 12 schematically shows a system for carrying out the method of the present invention.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

As shown in Fig. 1, the copying of (digital) audio signals may be considered to involve two categories or groups of copying operations:

- 5           Group 1: from digital to analog signals, and  
          Group 2: from digital to digital signals.

Although some of the techniques described in this document may also apply to copying from analog to analog signals (signal representations), the following discussion will focus  
10 on the copying of digital audio signals, that is audio signals registered in a digital representation (sampled audio signals represented digitally by ones and zeros).

Especially group 2 poses problems with respect to copyright, as the CD-burners and DAT-recorders normally allow  
15 perfect copies of the original signals to be made (it will be understood that so-called DAT-recorders are tape/cassette recorders which digitally register audio signals on tape).

According to a first aspect of the present invention, a low-frequency disturbance signal (also called first  
20 disturbance signal) is added to an (original) audio signal. Such a first disturbance signal is shown in Fig. 2. The signal has a frequency of approximately 2 Hz, although a range of frequencies from about 1 Hz to about 10 Hz may be used. It is only desired that the first disturbance signal is  
25 normally not audible. The amplitude of the second disturbance signal is of the same order of magnitude as the amplitude of the audio signal it is to be added to, and is preferably two or three times as large as the latter. The first disturbance signal is, like the second disturbance signal to be discussed  
30 later, preferably digitally generated.

The result of the adding of the signals is shown in Fig. 3. The mixed or combined signal of Fig. 3 is obtained by producing the sum of an original audio signal and the first disturbance signal of Fig. 2. When this signal is reproduced  
35 from e.g. a CD (Compact Disc), the low-frequency modulation is not audible. However, when the combined signal of Fig. 3 is copied onto tape (regular tape or cassette), the slow "shift" results in the recorded signal (shown in Fig. 4) being regularly interrupted. This is caused by the change in

signal amplitude between the peaks and troughs of the first disturbance signal, which induces an erasing effect in the recorder heads. It will be clear that the resulting signal of Fig. 4 has a very poor sound quality. The loss-less copying of the signal of Fig. 3 onto tape is thus effectively prevented by inducing a serious signal distortion.

According to a second aspect of the present invention, a second, high-frequency disturbance signal is applied to the audio signal. Preferably, as shown in Figs. 5-9, this modulation is applied to the original audio signal through the first disturbance signal, but the second disturbance signal may also be applied independently from, or even without, the first disturbance signal.

Fig. 5 again shows the first disturbance signal of Fig. 2. This low-frequency signal is mixed with a high-frequency second disturbance signal which preferably is a sine wave. This second disturbance signal preferably has an frequency of approximately 20 kHz, but may also have a varying frequency, as will be explained later. The frequency is chosen such that the second disturbance signal, like the first disturbance signal, is normally non-audible.

The signal of Fig. 6 is the resulting signal after multiplying the first disturbance signal of Fig. 5 with the second disturbance signal (product of the signal amplitudes). The signal of Fig. 7 is the resulting signal after adding the first disturbance signal of Fig. 5 to the second disturbance signal (sum of the signal amplitudes).

The signal of Fig. 8 consists of a low-frequency first disturbance signal combined with bursts of a high-frequency second disturbance signal (the bursts are schematically represented in Figs. 8 and 9 by shaded areas). These bursts preferably have a duration of about 50 to 200 ms and do preferably occur about the point where the first disturbance signal is "zero" (average signal value). By using a discontinuous second disturbance signal, instead of the continuous second disturbance signal of Figs. 6 and 7, a first disturbance signal having a much smaller amplitude can be used to obtain identical results. Thus, using a burst-like

second disturbance signal makes it possible to reduce the energy of the first disturbance signal.

The high-frequency bursts are even more effective when they occur in pairs, as schematically represented in Fig. 9. In the exemplary signal of Fig. 9, two high-frequency bursts (schematically represented as shaded areas) are located just before and just after each "zero" crossing of the low-frequency disturbance signal. It has proven less effective to locate the bursts around the peaks and troughs of the low-frequency signal. The paired bursts of Fig. 9 also allow a reduced low-frequency signal amplitude.

The heads of a tape (or cassette) recorder normally do not reproduce signals having a frequency of about 20 kHz. Feeding the signal of any of the Figs. 6-9 to the recording head of a tape recorder will result in a partial demodulation of the high-frequency disturbance signal. This partial demodulation will lead to a distortion of the signal, thus effectively protecting the signal against copying.

Advantageously, the high-frequency second disturbance signal is frequency modulated by at least one modulating signal. Alternatively, or additionally, the second disturbance signal is amplitude modulated by the at least one modulating signal. These modulations will result in a further distortion of the (partially) demodulated signal.

The modulating signal may contain spoken messages indicative of illegal copying, such as "this is an illegal copy" or "this recording is copy protected". The modulating signal may also be derived from the original audio signal and may comprise the original signal itself or its inverse (inverted original signal). Preferably, the modulating signal contains both spoken messages, the original signal and the inverted original signal, each during a certain time period of for example 30 seconds.

In order to produce a copy-protected recording, the modulating signals may be additionally registered on the information carrier (such as a CD) or may be transmitted separately via a satellite network, internet, or the like.

The disturbance signals described above are in particular suited for the prevention of copying without quality loss to



analog recorders (group 1 in Fig. 1). The (second) disturbance signal of Fig. 10 is in particular suited for the prevention of copying without quality loss to digital recorders, such as so-called CD burners.

5       The disturbance signal of Fig. 10 has a frequency which increases stepwise from 20 kHz to 30 kHz. As the sampling frequency used for CD recordings is about 44 kHz, the disturbance signal of Fig. 10 increases in frequency from just below half the sampling frequency (the Shannon  
10       frequency) to about three-quarters of the sampling frequency. As the frequency increases, the amplitude of the signal decreases. This type of signal proves to be highly effective in the prevention of loss-less copying. When mixed with an audio signal (by multiplying or adding), the signal of Fig.  
15       11 results. As shown in Fig. 11, the resulting signal has a decreasing amplitude (schematically represented by the drawn lines A), effected by the modulating signal. In the signal of Fig. 11, the amplitude variations caused by the frequency sweep are clearly audible.

20       In addition to the frequency sweep, the same modulating signals may be used to modulate the second disturbance signals of Fig. 10 as used for the second disturbance signal of Figs. 6-9. Thus spoken messages, the original signal and/or the inverted original signal may be used to further  
25       modulate the signal of Fig. 10.

      The system 100 shown by way of example in Fig. 12 is designed for copy protecting audio signals in accordance with the present invention. The system comprises signal sources 101-105, an analog to digital convertor 106, a signal  
30       processing unit (computer) 107 and signal destinations 108-112. The sources 101-104 of analog signals are connected to the signal processing unit 107 via the A/D converter 106, while the digital source 105 (e.g. a CD player) is directly connected with the signal processing unit 107.

35       The first source 101 is a programmable wave-form generator for producing the first and/or second disturbance signal. The second and third sources 102 and 103 are programmable FM and AM modulators respectively. The fourth

source 104 is an analog audio source, e.g. for producing spoken messages.

By means of the system 100, the method of the present invention may be readily applied.

5       An audio signal which has been combined with the disturbance signals according to the present invention may be stored on a commercially available information carrier, such as a floppy disc having a magnetic recording medium, or a CD having an optical recording medium.

10       Although the invention has been described with reference to audio signals only, it will be understood that its principles can be applied to other signals as well, e.g. video signals, by mixing normally non-perceivable disturbance signals with the original signal.

15       It will thus be understood by those skilled in the art that the present invention is not limited to the embodiments discussed above and that many additions and modifications are possible without departing from the scope of the present invention.

WHAT IS CLAIMED IS:

1. A method of protecting an audio signal against copying, the method comprising the step of mixing the audio signal with at least one non-audible disturbance signal.
- 5 2. The method according to claim 1, wherein a first disturbance signal is a low-frequency signal which is added to the audio signal, the low-frequency disturbance signal preferably having a frequency of approximately 2 Hz.
- 10 3. The method according to claim 1, wherein a second disturbance signal is a high-frequency signal which is multiplied with the audio signal, the high-frequency disturbance signal having a frequency of approximately 20 kHz.
- 15 4. The method according to claim 3, wherein the audio signal is a digital signal representation involving a sampling frequency, and wherein the second disturbance signal has a frequency which varies in time, preferably from approximately half to approximately three quarters of the sampling frequency.
- 20 5. The method according to claim 3, wherein the second disturbance signal is modulated by a modulating signal, said modulating signal comprising either alone or in combination:
  - 25 - spoken messages,
  - the original audio signal,
  - the inverted original audio signal.
- 30 6. The method according to claim 5, wherein the second disturbance signal is frequency modulated by the modulating signal.
- 35 7. The method according to claim 5, wherein the second disturbance signal is amplitude modulated by the modulating signal.

8. An information carrier comprising a recording medium storing an audio signal which is copy protected by mixing the audio signal prior to the storing with at least one non-audible disturbance signal.

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9. A device for protecting audio signals against copying, the device comprising signal generation means for generating at least one non-audible disturbance signal, mixing means for mixing the at least one disturbance signal with the audio signal, and output means for outputting the resulting mixed audio signal.

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10. The device according to claim 9, wherein the mixing means comprise adding means.

15

11. The device according to claim 9, wherein the mixing means comprise multiplication means.

12. The device according to claim 9, wherein the signal generation means are arranged for generating a first, low-frequency disturbance signal which is added to the audio signal, the low-frequency disturbance signal preferably having a frequency of approximately 2 Hz.

13. The device according to claim 9, wherein the signal generation means are arranged for generating a second, high-frequency disturbance signal which is multiplied with the audio signal, the high-frequency disturbance signal having a frequency of approximately 20 kHz.

14. The device according to claim 13, the device being arranged for copy protecting an audio signal which is a digital signal representation involving a sampling frequency, and wherein the signal generating means are arranged for generating a second disturbance signal having a frequency which varies in time, preferably from approximately half to approximately three quarters of the sampling frequency.

15. The device according to claim 13, wherein the mixing means are arranged for modulating the second disturbance signal by a modulating signal, said modulating signal comprising either alone or in combination:

- spoken messages,
- the original audio signal,
- the inverted original audio signal.

16. The device according to claim 15, wherein the mixing means are arranged for frequency modulàting the second disturbance signal by the modulating signal.

17. The device according to claim 15, wherein the mixing means are arranged for amplitude modulating the second disturbance signal by the modulating signal.

A B S T R A C T

In order to protect audio signals against copying, it is proposed to mix the audio signal with at least one non-audible disturbance signal. A first disturbance signal may be a low-frequency signal which is added to the audio signal, 5 while a second disturbance signal may be a high-frequency disturbance signal which is multiplied with the audio signal. Additionally, the second disturbance signal may be modulated by a modulating signal comprising either the original or inverted original signal, or spoken messages indicative of an 10 illegal copy.

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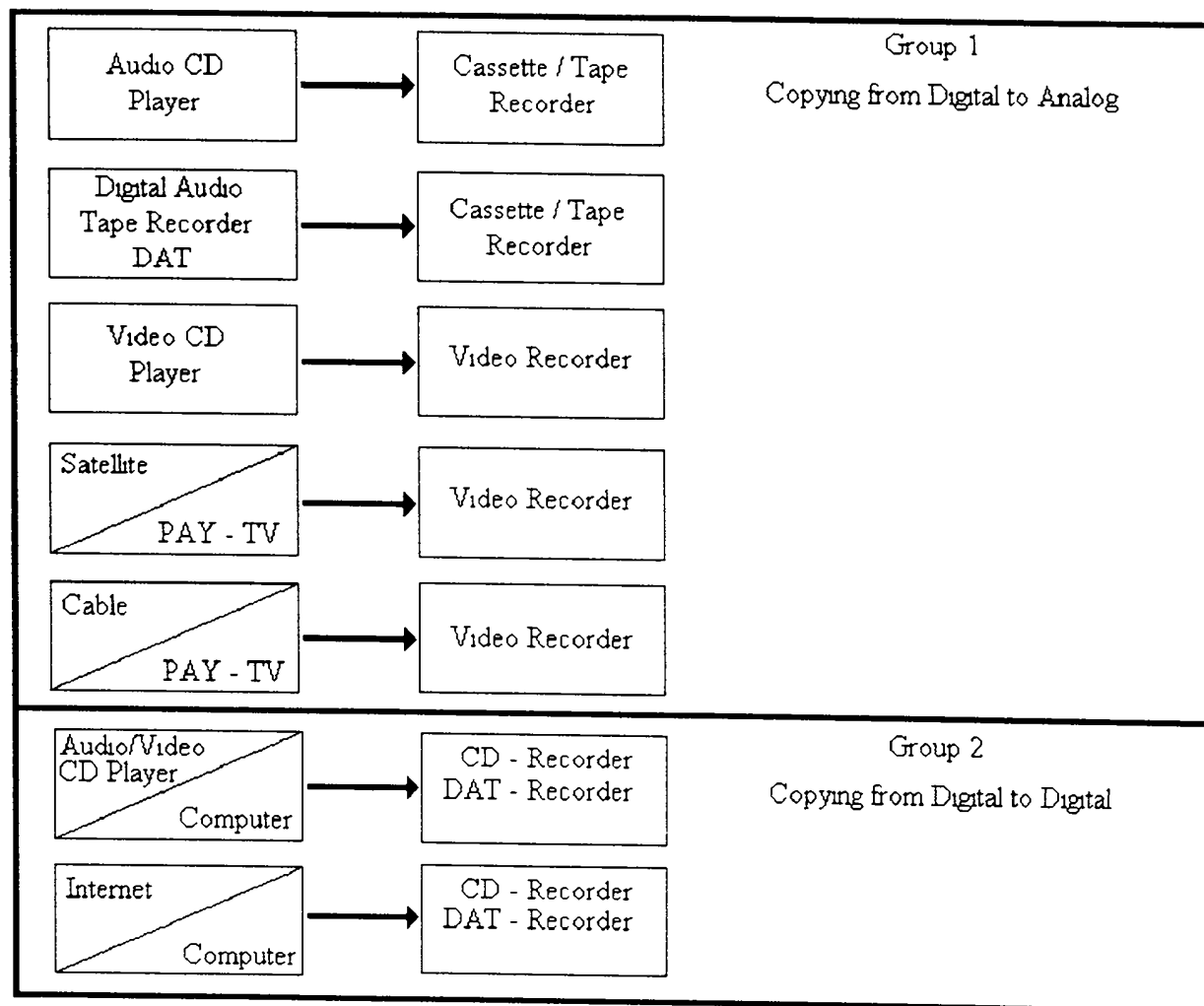
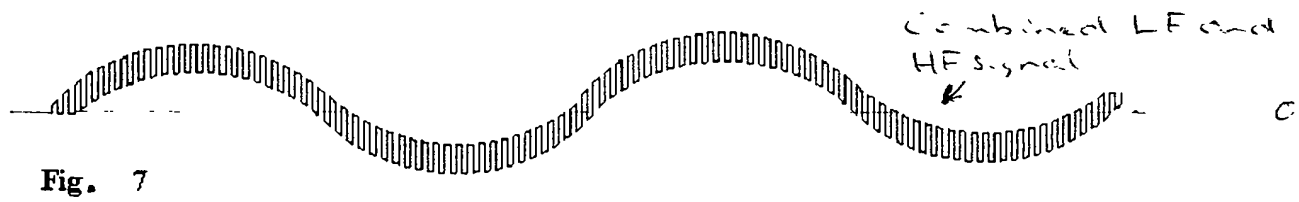
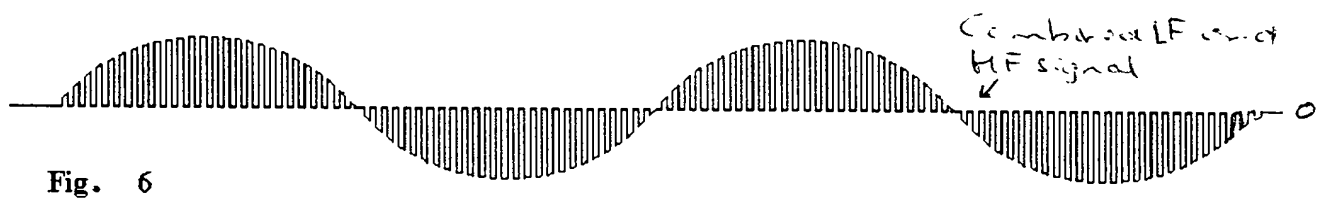
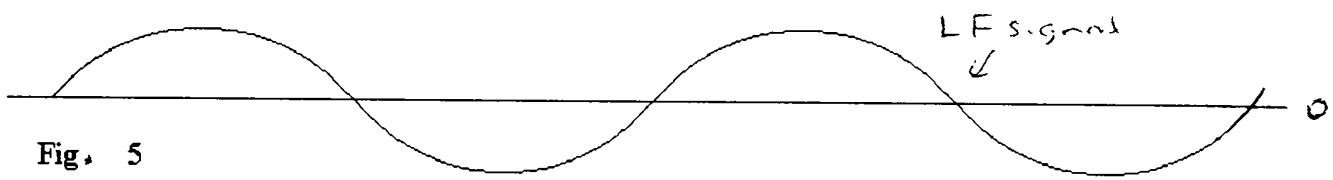
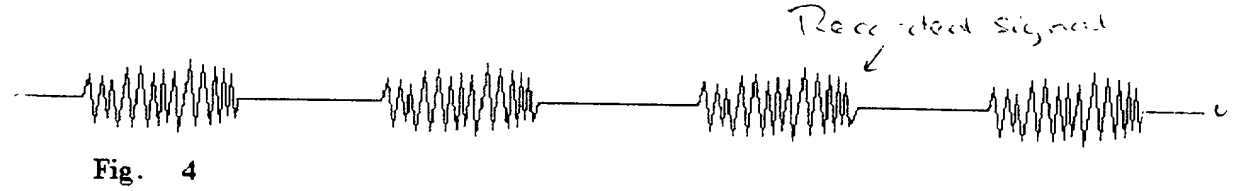
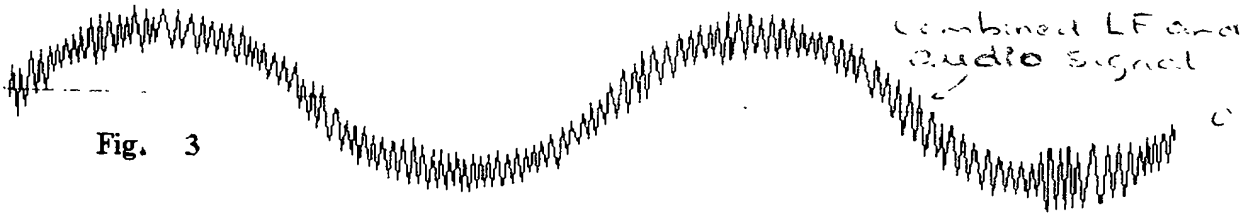


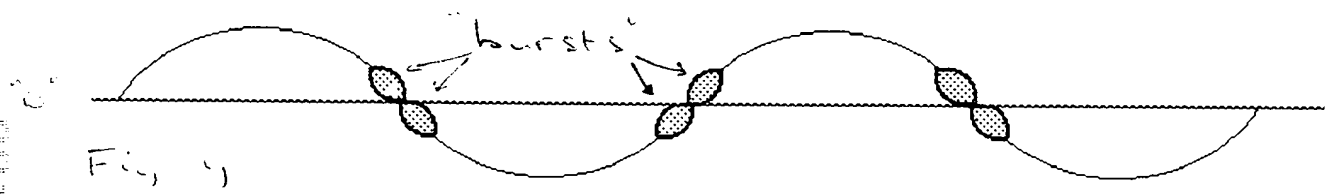
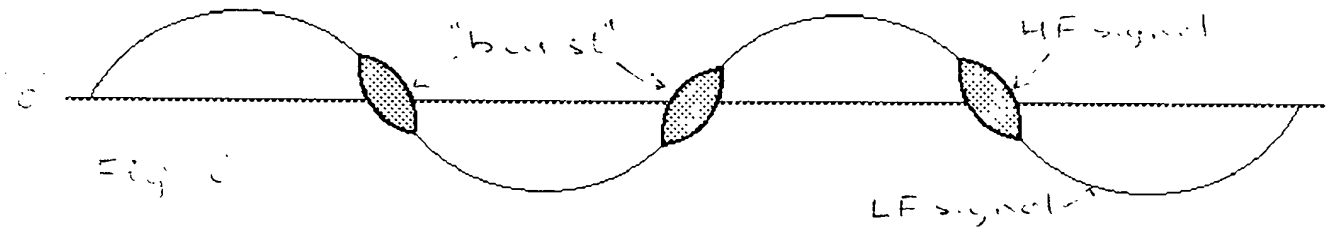
Fig. 1

2.1





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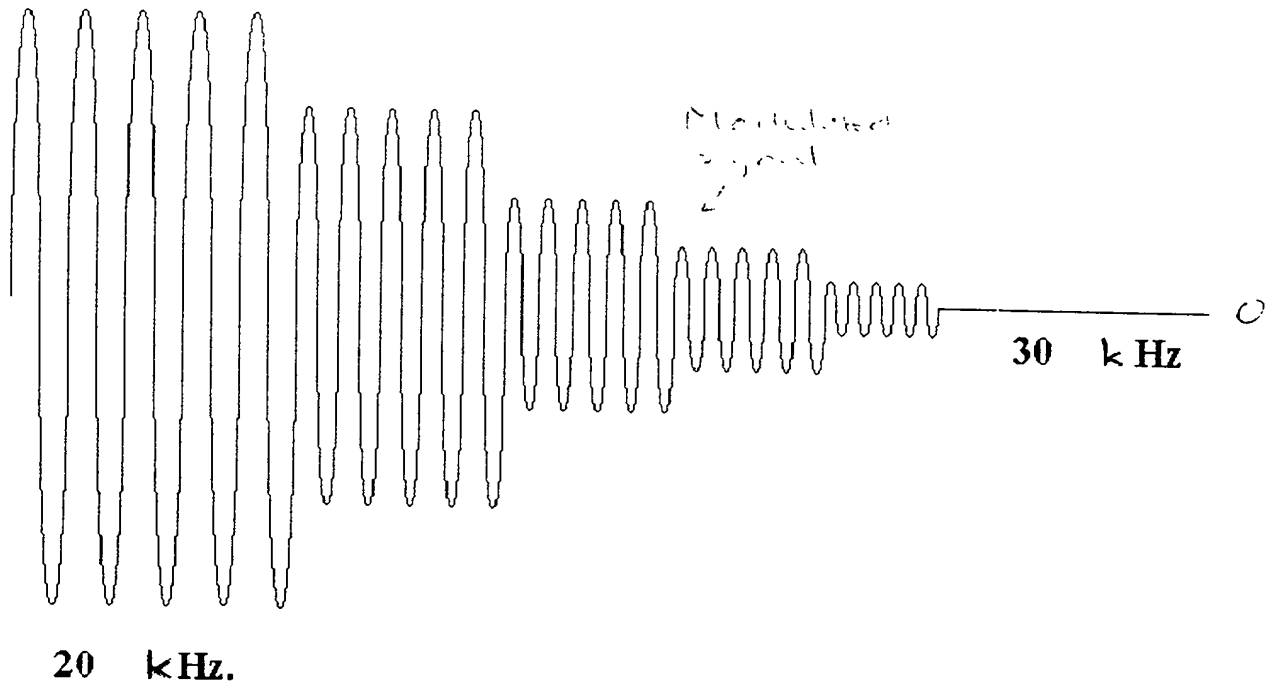


Fig. 10

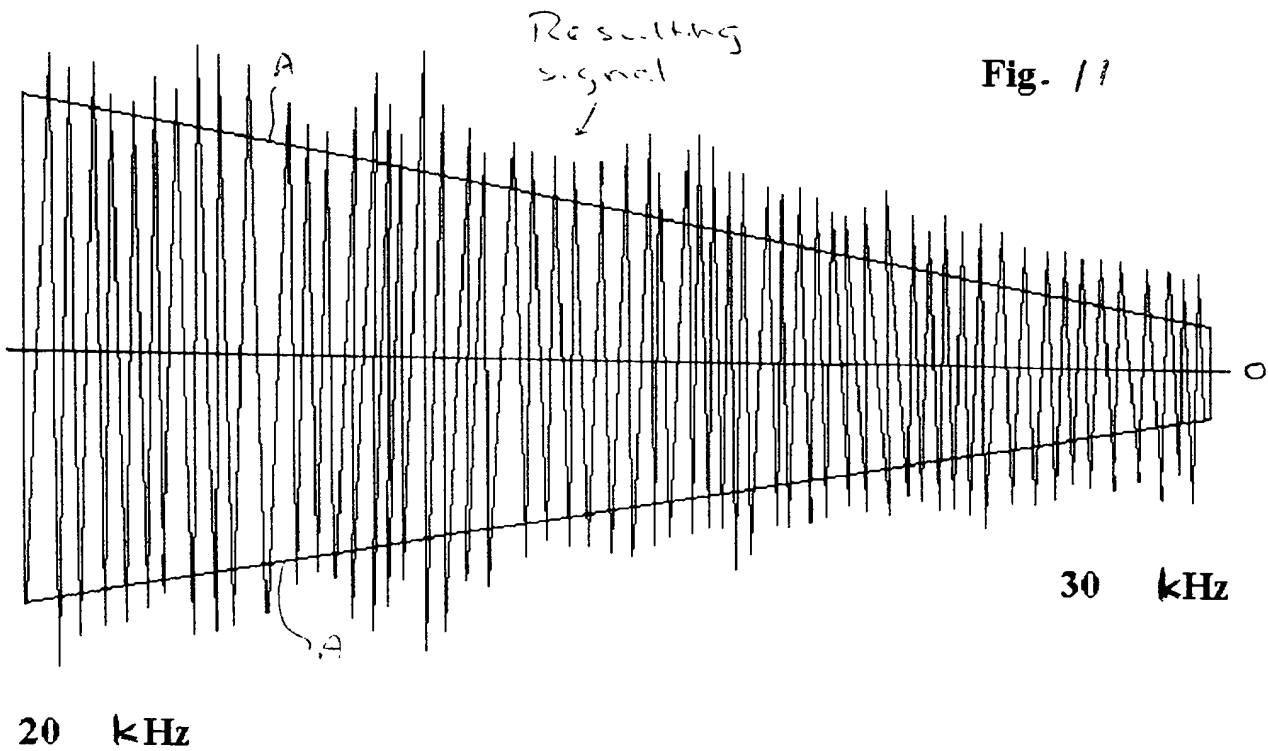
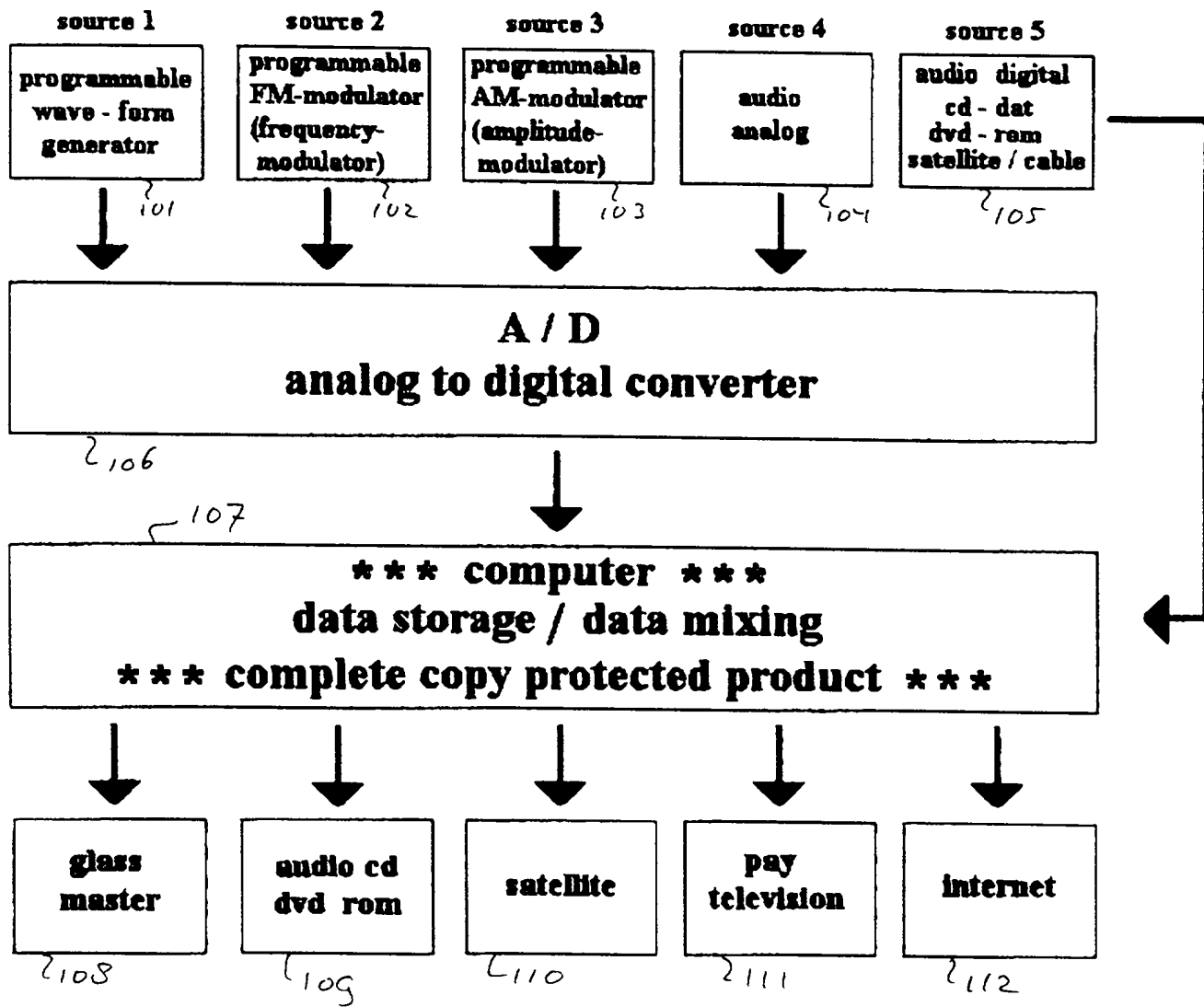


Fig. 11

- /



100 →

Fig. 12

986015-341

ATTORNEY'S DOCKET NO. \_\_\_\_\_

**DECLARATION FOR PATENT APPLICATION**

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Anti-copying system for audio signals

the specification of which is attached hereto unless the following box is checked:

☐ was filed on \_\_\_\_\_ as United States Application Number or PCT International Application Number \_\_\_\_\_ and was amended on \_\_\_\_\_ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR §1.56.

I hereby claim foreign priority benefits under 35 U.S.C. §119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 USC §119			
APPLICATION NUMBER	COUNTRY	(DAY/MONTH/YEAR FILED)	PRIORITY NOT CLAIMED
98201432.6	Europe	4 May 1998	<input type="checkbox"/>
			<input type="checkbox"/>

☐ CONTINUED ON PAGE

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below.

PROVISIONAL APPLICATION(S) UNDER 35 U.S.C. §119(e)	
APPLICATION NUMBER	FILING DATE

I hereby claim the benefit under 35 U.S.C. §120 of any United States application, or §365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. §112.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR §1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

for signatures see  
page 2

Declaration For Patent Application (Continued)

Atty. Dkt. No. \_\_\_\_\_

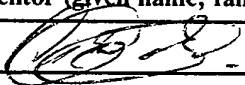
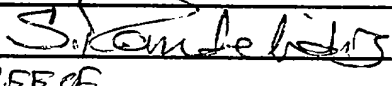
PRIOR U.S./PCT INTERNATIONAL APPLICATION(S) DESIGNATED FOR BENEFIT UNDER 37 U.S.C. §120		
APPLICATION NUMBER	FILING DATE	STATUS -- PATENTED, PENDING, ABANDONED

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith:

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 Marvin J. Spivak, Reg.No. 24,913  
 (continued on page 3)

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---	----------------------------------

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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<b>Inventor's signature:</b> 	<b>Date:</b> June 24, 1998
<b>Residence:</b> GREECE	<b>Citizenship:</b> NETHERLANDS
<b>Post Office Address:</b> BIKOU STREET No 24. ILIOUPOLIS 16342. ATHENS	
<b>Full name of second joint inventor (given name, family name):</b> SPIRO J. PANDELIDIS	
<b>Inventor's signature:</b> 	<b>Date:</b> June 24, 1998
<b>Residence:</b> GREECE	<b>Citizenship:</b> BRITISH
<b>Post Office Address:</b> 12A IRAKLEOUS STREET. ILIOUPOLIS 16345. ATHENS	
<b>Full name of third joint inventor (given name, family name):</b>	
<b>Inventor's signature:</b>	<b>Date:</b>
<b>Residence:</b>	<b>Citizenship:</b>
<b>Post Office Address:</b>	
<b>Full name of fourth joint inventor (given name, family name):</b>	
<b>Inventor's signature:</b>	<b>Date:</b>
<b>Residence:</b>	<b>Citizenship:</b>
<b>Post Office Address:</b>	

UNITED STATES OF AMERICA  
DECLARATION FOR PATENT APPLICATION

I hereby further appoint:

C.Irvin McClelland, Reg.No. 21,124; Gregory J. Maier, Reg.No. 25,599; Arthur I. Neustadt, Reg.No. 24,854; Richard D. Kelly, Reg.No. 27,757; James D. Hamilton, Reg.No. 28,421; Eckhard H. Kuesters, Reg.No.28,870; Robert T. Pous, Reg.No. 29,099; Charles L. Gholz, Reg.No. 26,395; Vincent J. Sunderdick, Reg. No. 29.004; William E. Beaumont, Reg.No. 30,996; Steven B. Kelber, Reg.No. 30.073; Robert F. Gnuse, Reg.No. 27.295; Jean-Paul Lavalleye, Reg.No. 31.451; Stephen G. Baxter, Reg. No. 32,884; Martin M. Zoltick, Reg.No. 35,745; Robert W. Hahl, Reg.No. 33,893; Richard L. Treanor, Reg.No. 36,379; Steven P. Weihrouch, Reg.No. 32,829; John T. Goolkasian, Reg.No. 26,142; Marc R. Labgold, Reg.No. 34,651; William J. Healey, Reg.No. 36.160; Richard L. Chinn, Reg.No. 34,305; Steven E. Lipman, Reg.No. 30,011; Carl E. Schlier, Reg.No. 34,426; James J.Kulbaski, Reg.No. 34,648; Catherine B. Richardson, Reg.No. 39,007; Richard A. Neifeld, Reg.No. 35,299 and J. Derek Mason, Reg.No. 35,270.

STATEMENT AS TO AUTHORITY TO ACCEPT INSTRUCTIONS OF FOREIGN AGENT  
(To be attached as Page 4 to Declaration for Patent Application)

The undersigned hereby authorizes the U.S. Attorney or Agent named herein to accept and follow instructions from  
van Exter Polak & Charlouis B.V., P.O. Box 3241, 2280 GE,  
Rijswijk (The Netherlands) as to any action to be taken in the  
U.S. Patent and Trademark Office regarding this application  
without direct communication between the U.S. Attorney or Agent  
and the undersigned. In the event of a change of the persons from  
whom instructions may be taken, the U.S. Attorney or Agent named  
herein will be so notified by the undersigned.

98605/134

Serial or Patent No. : New Application  
Filing ~~or Issue~~ Date : Herewith Docket No. 9655-0001-2  
Applicant or Patentee: Spiro J. PANDELIDIS and Arie M. WIJNEN  
For: Anti-copying system for audio signals

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS  
37 CFR 1.9(f) and 1.27(c) - SMALL BUSINESS CONCERN

I hereby declare that with regard to the small business concern identified below I am

- ☐ the owner of the small business concern  
☒ an official of the small business concern empowered to act on behalf of same

NAME OF CONCERN Spiro J. Pandelidis High Tech Applications

ADDRESS OF CONCERN 12 Irakleous Street, Ano Ilioupolis, 16345 ATHENS, Greece

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under 35 USC 41(a) and (b) in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention entitled Anti-copying system for audio signals by inventor(s) Spiro J. PANDELIDIS and Arie M. WIJNEN described in

- ☒ U.S. Patent Application filed herewith  
☐ U.S. Patent Application Serial No. \_\_\_\_\_ filed \_\_\_\_\_  
☐ U.S. Patent No. \_\_\_\_\_ issued \_\_\_\_\_

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having the rights to the invention is listed below\* and no rights to the invention are held by any person, other than the inventor, who could not qualify as a small business concern under 37 CFR 1.9(d) or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a non-profit organization under 37 CFR 1.9(e). \*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. 37 CFR 1.27

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

- ☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

- ☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

I acknowledge the duty to file in this patent application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. 37 CFR 1.28(b)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 USC 1001, and that such willful false statements may jeopardize the validity of the patent application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING Spiro J. PANDELIDIS

ADDRESS OF PERSON SIGNING 12 Irakleous Street, Ano Ilioupolis, 16345 ATHENS, Greece

SIGNATURE S. Pandelidis DATE June 24, 1998